DOCUMENT RESUME

ED 046 662 RE 003 282

AUTHOR Fry, Edward
TITLE A Classification of Factors Affecting Reading Performance.
PUB DATE 5 Dec 70
NOTE 20p.; Paper presented at the National Reading Conference, St. Petersburg, Fla., Dec. 3-5, 1970
AVAILABLE FROM Twentieth Yearbook of the National Reading Conference, Inc., Marquette University, 1217 W. Wisconsin Ave., Milwaukee, Wis. 53233

EDRS PRICE EDRS Price MF-$0.65 HC Not Available from EDRS.
DESCRIPTORS *Classification, Factor Structure, Learning Characteristics, *Reading, *Reading Instruction, *Reading Processes, *Taxonomy

ABSTRACT

A classification of factors that go into the complex process of reading or learning to read is presented. These factors are listed in outline format under the following sections: (1) sensory input, (2) mediating activity, (3) response, (4) reward and/or motivation, (5) knowledge of results, (6) reward variations, (7) rate of reading, (8) practice and review, (9) readability, (10) reading content, (11) subject matter organization, (12) supplementary presentations, (13) classroom environment, (14) the lesson, (15) individual differences, (16) environmental influence and previous learning, (17) measurement of reading ability, and (18) training efficiency. Each factor is further subclassified and discussed. (DE)

ED046662

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

A CLASSIFICATION OF FACTORS AFFECTING READING PERFORMANCE*

by

Edward Fry
Director, Reading Center
Rutgers - The State University
New Brunswick, N. J.

"PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY

Edward Fry

TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE U.S. OFFICE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER."

RE003 262

*Paper presented before the National Reading Conference, St. Petersburg Florida, December 5, 1970.

The purpose of this paper is to lay out all of the factors that go into the complex process of reading or learning to read. These two processes, reading and learning to read, are really points on a continuum if you accept the underlying thesis that all reading, from one word on a "STOP" sign to a text on physics, is really a type of learning situation.

Another important thing to keep in mind is that the ultimate goal, or behavioral objective, if you prefer, is comprehension with efficiency.

Choosing a title for this paper was a perplexing problem. My first inclination was to call it a task analysis. But a task analysis is somewhat behavioral, and many of the categories in reading are cognitive, if not affective, and certainly part of the categories discussed are functions of the material (not the reader), such as legibility and readability.

So, I considered the term "taxonomy." However, it seems a bit formal, and it seems to apply to a better structured and simpler area such as the classifying of all living things.

Some of you may prefer to call it "Fry's Folly." Others will swear it is the most boring work of the century. I don't deny that it is boring or at least exhausting to look at all at once. It takes almost as much courage to present this as it does for you to absorb it, so if some of you have pressing appointments elsewhere, I will understand.

But, secretly, I hope that this classification might be useful to somebody sometime. Perhaps some lone graduate student looking for some unplumbed variable for a thesis topic could get an idea from it. Maybe a teacher could gently cram it down the throat of some innocent parent who wants to know why it is so hard to teach his child to read when the other kids all seem to learn.

But, in reality, it is probably only educational researchers who are apt to appreciate its complexity and understand its many faults. So, its short term goal is the improvement of research design, and its long term goal is the improvement of materials and methods for teaching reading. A few courageous college instructors might use it to influence their course structure or give it to students who wish something more than the instructor's manual for Dick and Jane.

This classification is based on one I did for the programmed instruction area that appeared in my book, Teaching Machines and Programmed Instruction (McGraw Hill 1963), and it has been modified for reading purposes and will appear in my next book, Reading For Classroom and Clinic (McGraw Hill, In Press).

CLASSIFICATION

A. Sensory Input

1. Visual
    a. Opaque
    b. Projected
    c. Color - contrast

2. Tactual

3. Kinesthetic

It seems logical to start classification with a discussion of the sensory input. One of the obvious things about the reading act is that some sensory input must be received by the reader. In reading, this input is received usually through the visual sense, since almost by definition, reading requires use of the eyes; however, there are exceptions, notably the reading done by blind persons, who use their tactual sense. Occasionally in a remedial reading or special reading situation, the tactual sense (sense of touch) is used by having the students feel raised letters or trace words in sand.

One rather famous method, developed by Fernald, emphasizes the kinesthetic sense in which sensory input is carried to the brain by the movement or position or position of the muscles. Fernald's method is really a multisensory approach in which the child traces letters with his finger, so that tactual, visual, and kinesthetic senses are usually employed simultaneously.

Some of the problems in the reading act that would fall under the sensory input category relate to the validity of visual perception training. Research reports certainly are not clear on the value of this type of training, but neither do they state clearly that it should be disregarded. A number of reading teachers have used tachistoscopes and some of the reading-readiness activities involve so-called perceptual training.

Another type of problem that might fall into this area is the question of whether there is any difference in reading comprehension or reading efficiency if the material is presented by an opaque or projected image. An ordinary printed page is an opque image, and a page or word projected on a screen is an illuminated projected image. Research needs to be done to see whether there is a different stimulus value in terms of reading comprehension. Some comparison studies have made use of colored ink or paper.

B. Mediating Activity

1. Vocalization
2. Sub-vocalization
3. Thinking about
4. Phonics
5. Word-part recognition

Between the time when the reader sees the reading material and makes a response, some type of mediating activity usually occurs. This activity may be overt or covert, that is, it may be an activity which can be seen or heard by someone else, or one which goes on solely within the student's mind. Vocalization, for example, is quite obviously an overt task: the student, while reading for himself, will say the words so that somebody sitting near him can hear him say them. This is generally not advisable for silent reading, but it often occurs with poor or beginning readers. Sub-vocalization cannot be observed by someone else, and goes on inside the reader's head. He says the words to himself so that he may "read" or comprehend. Some research has shown that during most so-called silent reading there are very minute muscle movements in the tongue or vocal chords. Other observations show that some reading comprehension can occur with virtually no sub-vocablization.

Elementary children are often told to think about the material, both in oral and in silent reading. It is difficult to give the proper intonation of the sentence if the student does not understand it and does not think about what it means. This point touches on a problem of major concern to teachers and researchers, i.e., the nature of internal processes involved in reading. Undoubtedly, the reader is testing what he is perceiving against a mass of background information. For example, when he perceives the word "dog" it calls up some memory of a dog or a concept of a dog in his mind. Exactly what goes on in the brain during the reading act is not known, but physiologists are beginning to pinpoint with some precision various areas of the brain, and it is hoped that some insights will be forthcoming as they are able to map out in greater detail the brain areas which deal with speech, memory for colors, arousal of emotional feelings, visual imagery, word knowledge, and others.

Very poor readers may need phonics to help them unlock certain words. If a student looks at the word, has to think of how the letter sounds, translates this into a word which he knows by listening, and then acts upon the word or fits it into his comprehension scheme, all of this is mediating activity. Instead of using phonics in the initial step, many students use word parts for difficult words. They may know both parts of a word separately and be able to put them together, or they may know one and be able to guess the rest using context cues.

It is probably quite safe to say that at all levels of reading, from beginning to the most advanced, a good deal of mediating activity takes place, although the type of mediating activity probably changes as the reader matures.

C. Response

1. Observable Behavior

   a. Read aloud
   b. Perform act
   c. Answer questions in writing
   d. Answer questions orally
   e. Emotional response (cry, laugh)
   f. General attitude or behavioral change

2. Content of Response

   a. Repeat verbatim
   b. Paraphrase
   c. Summarize
   d. Criticism and higher order verbal acts (see Bloom's Taxonomy.

3. Delay of Response

   a. Immediate
   b. After varying delay

The response is generally what might be called "doing something." It is the type of behavior that can be observed by someone else. This is in contrast to mediating activity discussed above, which can be internalized and is not directly observable by another person. Perhaps one of the most common observations of reading behavior in the elementary school is reading aloud. However, there are numerous other ways of responding to written material; the reader may perform an act or answer questions either in writing or speaking.

Another type of very meaningful response is an emotional response which is observed in such reader response as laughing, crying, or exhibiting other evidence of feeling. Somewhat less direct, although perhaps of greater importance, is a general change in attitude or behavior which persists over a longer period of time.

The form of response may display considerable variability. Bloom's Taxonomy could be applied to the reading act. It was seen that responses to reading can vary all the way from giving facts or practical applications to critical analysis.

The response to reading need not always occur during the reading act, or immediately following it. The delay of response may be extended for as long as a lifetime. The most usual measure of comprehension is to have the student make responses to questions almost immediately after the reading; but frequently, as in tests of various subject matter courses, the student may be expected to respond some hours or months after he has read the chapter. Delay of response brings in the factor of memory and other factors of learning.

D. Reward and/or Motivation

1. Primary
2. Secondary
3. Knowledge of results
4. Subjective
5. Punishment
6. None (incidental)
7. Set

Some psychologists state that people do not do anything without expectation of a reward, whether the reward be money, food, or a feeling of pleasure. In any event, nearly every act has some kind of consequence. The kind of consequence that the act produces helps to determine whether the act will be continued or repeated, and, if repeated, whether it will be modified.

The topic of reward is almost indistinguishable from the topic of motivation. Why does a person do something? He does it because he will be rewarded or because if he does not do it he will be punished, and the absence of punishment is, in itself, a type of reward.

Knowledge of results is a type of reward. Knowing that we have done something correctly tends to encourage us, to make us feel good. If we find out that we did not do it correctly, we know that we must modify our behavior in order to be rewarded in the future.

Psychologists have broken rewards down into two categories: primary and secondary. Primary rewards are those which satisfy body needs directly. For example, a person without air is rewarded by being given air; a person without water is rewarded by being given water, etc. Secondary rewards are those which lead to primary rewards. For example, money is a good secondary reward because it can be used to buy food or warmth or satisfy various other primary needs.

Man has in common with animals a variety of primary needs, such as food and warmth; but man is distinguished from animals by his more elaborate and often highly subjective needs. Ego satisfaction, which drives men so far in life, or curiosity about the stars, which

motivate others, are difficult to equate with the primary need structure. Nevertheless, they have real motivating power. They can cause students to want to learn how to read, and can drive them to read book after book.

Punishment should also be classed with rewards because it does act as a motivating force. It is sometimes called "negative reward." Whereas corporal punishment has all but vanished from our schools, its subtler forms (teacher's scorn or extra work assignments) are still factors in many learning situations.

There are times when students learn for no apparent reason. This is called incidental learning. It can sometimes be accounted for if we say simply that a person is naturally curious and wants to learn just because there is something to be learned. Another variable is the student's "learning set," in which case the learning is greatly enhanced when the student intends to learn. Any teacher can testify to the importance to the student of wanting to learn how to read.

Motivation, it is seen, is closely interrelated to many other factors. If the student is highly motivated, he can read material which has a high difficulty level, or can learn with less practice, or can learn faster. Most of the variables in the classification are highly interdependent.

E. Knowledge of Results

1. Type

    a. Simple (right or wrong)
    b. Correct response (shown if wrong)
    c. Explanation given

2. Method of presentation

    a. Teacher
    b. Answer key
    c. Programmed instruction
    d. Life situation

We have already mentioned that "knowledge of results" is one of the important factors affecting the reward. Since it is also an important part of the teaching situation, and is usually controlled by the teacher, it should be given attention again at this point. The simplest type of knowledge of results in the teaching situation can be illustrated by the teacher who says, "That's wrong." A slightly better teaching situation might occur when the teacher says, "The word was cog not dog." A superior situation would be when the

teacher says, "The word was cog -- don't you notice that the beginning letter is C not D?" Hence these three examples show the three main types of knowledge of results: (a) simple (right or wrong); (b) correct response; and (c) explanation given.

In addition to the teacher, such reading materials as games, workbooks, and teaching machines can also give all three types of knowledge of results.

While the teacher's explanation might appear on the surface to be the best type of knowledge of results, it is probable that it is the best type only in certain situations. It is the most difficult and time-consuming to give.

Sometimes the simple type of knowledge of results can be so quickly and easily administered in such situations as programmed instruction, that it is administered with a high degree of frequency, and is equally effective.

However, the method by which the knowledge of results is presented may have high value and affect the reader's comprehension. He may consider the knowledge of results more important if the teacher tells it to him.

Many workbooks and other training materials such as reading laboratories have answer keys for the student to check answers following various comprehension drills. A newer learning technique, that of teaching machines and programmed instruction, places heavy emphasis on the immediate and complete giving of knowledge of results. Programmed learning would give the student knowledge of results immediately following each question or small segment of material.

Out of school, in real-life reading situations (as opposed to training situations), the reader frequently gets knowledge of results. If he is trying to follow a set of printed directions, his inability to assemble a machine might quickly tell him that his reading comprehension is lacking.

In any event, teachers and learning psychologists concur that knowledge of results is extremely important for learning.

F. <u>Reward Variations</u>

1. Amount
    a. Fixed amount per unit
    b. Variable amount per unit

8.

2. Frequency
    a. Every unit
    b. Not every unit (partial; fixed ratio; variable ratio; fixed interval; variable interval)

3. Relation to response
    a. Indiscriminate (occurs whether response is right or wrong)
    b. Discriminating (only right answers rewarded)
    c. Shaping

4. Timing
    a. Immediate
    b. Delayed

This is a rather technical category, but it has some interesting teaching applications. The first section deals simply with the question of whether a constant or variable amount influences the rate of learning. For example, some teachers might always say, "That's good," if the student answers a question correctly or reads orally satisfactorily. At other times the teacher might go into brief periods of ecstacy about the superlative performance of the child. Some parents have the questionable practice of paying children for bringing home A's and sometimes the amount of reward can vary considerably from the elementary school child who gets 25 cents for an "A" to the high school student who receives an automobile. There can be little doubt that the amount of reward has some effect on the student's performance.

The section on frequency uses many terms derived from B. F. Skinner's work with animal performance. However, it has some interesting implications for the teaching of humans. A <u>fixed</u> ratio would provide student reward every time he answered a question, or every fifth time he answered a question, while a <u>variable</u> ratio might mean that he <u>would be rewarded</u> on the average of every fifth question. Likewise, the variations in interval have to do with the time elapsed; for example, the teacher would tell the student he was doing good work every five minutes exactly, or would reward him on the average of every five minutes. Incidentally, experiments with animals have shown that much more continuation of the activity will occur under a variable type reinforcement. Since this highly irregular spacing of intervals is the type of reinforcement which occurs in most classrooms; it is likely that this also tends to promote greater continuation of the performance after the rewarding has stopped.

Only a very poor teacher would use indiscriminate rewarding, or tell the student he was doing well, regardless of the merit of his performance. However, some teachers who do not take proper care of their grading may be doing this.

An interesting notion related to this area is that of shaping or rewarding the student only as he comes closer and closer to the desired goal. In this situation, the teacher gives a reward for very simple and even for only partially accurate responses at the beginning of training, but as training progresses and the student matures, rewards are given only for increasingly better responses.

Most studies in psychology agree that the more immediate the reward after the act, the better the learning. Teachers should set up lessons which would allow the student to know as quickly as possible after he has performed an act whether or not it was correct. This is one reason why tutoring is more effective than large-class teaching. Immediacy of knowledge of results is one of the strong points of the programmed learning and teaching machines. Workbook and teaching materials which are self-correcting or can be corrected by the student in a group immediately after he has responded also take advantage of this principle.

G. Rate of Reading

1. Student controlled vs. other control

2. Speed set

3. Relaxed

4. Study set

5. Skimming

The rate of reading is usually controlled by the student, but there are some special circumstances in which other controls can be applied; for example, a pacing device has a shutter which slowly covers the page, forcing the student to read at a certain rate. The rate of reading can also be greatly varied by the student's intention. If, for example, he has a speed set and tries to read as fast as he can, his reading speed will definitely be faster than when he is relaxed. The purpose of his reading will sometimes affect his rate of reading. Sometimes the student will wish to study slowly enough so that he can remember every detail; at other times he will merely skim to glean the main ideas or to pick out certain kinds of information.

H. Practice and Review

1. Practice or review vs. none

2. Planned practice or review

3. Only as needed

4. Amount learned or read before practice

5. Massed vs. distributed

Let us look at the Practice and Review section from the standpoint of reading comprehension, even though all of these categories could be applied to practically every kind of reading lesson. In the first instance, different types of reading comprehension will ensue for the student who is allowed to reread the materials as he wishes. This review may be planned; for example, the teacher may say, "Be sure to read this page twice;" or the student may simply go back and read a paragraph he did not understand clearly.

The amount of material that a student reads before reviewing also can affect his comprehension. The student who reads an entire book before going back may have better comprehension than the student who rereads each page as soon as he is done with it.

The topic of mass vs. distributed practice has been studied by psychologists for some time. This refers to whether the training or reading is done all at once or at spaced intervals. A student who reads a topic for a half hour a day might comprehend more fully than the student who spends eight hours in one day reading the material.

I. <u>Readability</u>

1. Legibility
2. Word difficulty
3. Sentence difficulty
4. Style difficulty
5. Picture or graph cues
6. Familiarity-student with subject
7. Difficulty of subject

The concept of readability and its practical offshoot, readability formulas, have importance for ranking the difficulty level of printed verbal materials for a given group or individual. Most readability formulas use two major factors, word difficulty and sentence difficulty, though many other factors may be involved.

Word difficulty can be measured by such things as frequency of occurrence, word length (in letters or syllables) word depth (roughly use and position in sentence) and knowledge of the words meaning for a specific group or individual. Sentence difficulty is usually measured by length which is often a function of grammatical complexity, but many other factors, such as syntax and pattern familiarity, can be involved.

Legibility involves letter form, white space on a page, and familiarity of the student with the type style. Prior knowledge or familiarity with content also influence a passage's readability.

The writer's style also affects readability. Some authors express themselves in a crystal-clear fashion, while others, writing on the same subject, seem to do their best to confuse the issue. It is quite possible that part of the difficulty could be due to differences in the reader. The first writer may be able to communicate with a certain type of reader because he has amassed a similar background, vocabulary load, mode of expression and other traits.

Frequently beginning reading books rely heavily on pictures to provide clues to the meaning of the reading material. Other books, particularly texts, use pictures and graphs for further elucidation of the ideas expounded in the text. The difficulty of the subject matter is also related to the readability of written material.

J. Reading Content

1. Scientific
2. Social Science
3. Artistic, poetic, literary
4. Mechanical
5. Language style and variations
6. Mathematic
7. Philosophical

Some persons can read about Political Science with ease but have difficulty reading about Biology.

This section is intended to enumerate some of the different types of reading materials which are interdependent variables in the task of teaching reading comprehensibly. These subject categories are particularly related to the student's individual experience, interest and learning. No attempt is made here to give an exhaustive list of content areas. Melville Dewey and the Library of Congress have devised a detailed system for classifying reading matter.

K. Subject Matter Organization

1. Chronologic (historical)
2. Unit (natural unit in subject matter)
3. Problem-centered
4. Descriptive
5. Sequential (steps 1, 2, 3, etc.)

6. Theoretical

7. Practical

8. Analytic (whole to part)

9. Synthetic (part to whole)

These categories are fairly self-explanatory. The thing to keep in mind here is that a change in the type of organization can affect comprehension, rate of reading, and the amount of practice needed. In short, each category is a dependent variable.

L. Supplementary Presentations

1. Visual
    a. Pictures
    b. Graphic material
    c. Filmstrips
    d. Motion pictures
    e. Written (charts, outlines)

2. Audio
    a. Verbal
    b. Music

3. Laboratory experience (realia)

4. Instructors (to answer questions)

5. Discussion group

6. Reference materials or text

7. Traditional class or lecture

8. None

Quite frequently elementary texts provide aids to comprehension, in addition to the written material. The pictures in pre-primers are a familiar supplement. They almost carry the story. In many textbooks and in most other types of books, pictures and graphs often provide valuable aids for understanding the written text. The pictures and graphs are not always printed in the book, but may be presented by the teacher or made available to the student elsewhere. Some teachers, for example, make excellent use of filmstrips and motion pictures to stimulate interest in reading and to motivate the students to read stories or books.

The supplements are not all visual; frequently a talk by the teacher or a record serves much the same purpose. Some experimental use has been made of having students read while music is being plaoyed.

There are numerous ways of supplementing reading experiences. Laboratory experiences and realism (for example, seeing a real fire engine) are two of these ways. Merely having the instructor around to answer the students' questions can be another important form of supplemental help, as are discussion groups, reference material, and traditional lessons on the subject being read about.

No supplements may be involved in the reading of novels, in taking reading tests, or in many other situations.

M. Classroom Environment

1. Teacher personality (dynamic, bright, etc.)

2. Teacher training

3. Peer-group pressure

4. Physical conditions (temperature, ventilation, noise, etc.)

5. Classroom emotional climate
   a. Autocratic -- Unstructured
   b. Hawthorne effect

6. Size of class or group

In the classroom many things affect learning. A teacher who is bright and dynamic may be better for most children than a slow and dull teacher.

Students pick up many of their attitudes and aspirations from the peer group or other students. In some communities some groups would highly value reading and learning to read, while others might place less emphasis on it.

The physical conditions of the classroom affect reading or learning to read. It would be quite hard to concentrate on reading if the temperature were a constant 99 degrees, and the ventilation poor. Numerous physical distractions can detract from reading comprehension - noise, movements, and other sorts of distracting stimuli.

Classrooms or learning groups also acquire various emotional climates. Some students, it has been observed, perform better under a relatively authoritarian teacher and others under a moderately permissive teacher. Another factor which affects the classroom emotional

climate and has limited many research studies is the "Hawthorne effect," which occurs when the student and teacher know that they are in an experiment, and try harder than they normally would, thereby giving the experimental group falsely high results.

While it is by no means clear that poorer instruction is always done in larger groups, the class size or reading group size can affect learning. Some students pay attention better in smaller groups than they do in larger groups.

N. <u>The Lesson</u>

1. Length of lesson
2. Variety in the lesson
3. Variety of different lessons
4. Frequency of lessons
5. Time of day
6. Time of year
7. Individual's activity

If a lesson goes on too long, learning will cease. The problem of how long is "too long" is often solved by experienced teachers who notice when children grow restless and cease to pay attention. Sometimes a number of short lessons is superior to one long lesson. Variety within the lesson can sustain interest and prolong the effective training time. Teachers who interchange the different types of activity can lengthen the interest span. Varieties in the types of lessons can also help to sustain interest and increase learning.

The frequency of lesson periods also affects overall learning. Whether lessons are held twice a day or once a week can make a difference, even though the total training time remains the same. The time of day and time of year also make a difference. Trying to teach reading during the last hour of the day or during the last week of the school year is a difficult and trying task.

The amount of activity engaged in by each pupil also affects his interest and learning. Donald Durrell offers an interesting learning concept which he calls "density of response." An example of a very low "density of response" lesson (and hence a poor lesson) is the typical situation in which the teacher says, "Johnnie, come up to the board and point out the long A." Much time is wasted while Johnnie walks from his seat to the blackboard. Moreover, only one student is active in pointing out the A. With this type of instructional situation, the average student could make very few responses each hour and each day. In contrast, under a programmed learning situation, each student responds to a large number of small bits, perhaps two or three per minute.

O. Individual Differences

1. Learning ability
   a. General intelligence (e.g., Binet IQ)
   b. Simple factoral systems (e.g., Wechsler Intelligence Scale for Children, Primary Mental Abilities Test)
   c. Complex factor system (e.g., Guilford)
   d. Extrasensory perception

2. Biological factors
   a. Age-maturity
   b. Health (general, eyes, ears, etc.)
   c. Fatigue (initial and terminal)
   d. Sex differences
   e. Body chemistry

3. Personality characteristics
   a. Personality types and factors (e.g., Thematic Apperception Test, Minnesota Multiphasic Personality Inventory, introversion-extroversion needs, achievement motive, the work of analysts Freud, Adler, Jung)
   b. Mental health

Intelligence is undoubtedly the chief factor in reading comprehension. Measures of intelligence seem to proliferate with the years. They stretch from Binet's original concept of general intelligence through the well-known Wechsler test (which tests some ten abilities) to more modern models, like Guilford's structure of the intellect comprising 125 different categories. Certain factors, such as memory for symbols, or ability to synthesize, might have much greater bearing on the reading act than other intellect factors. There are also special types of differences in learning abilities. Some children prefer to learn from a visual rather than an auditory stimulus. The extreme example of this is "idetic imagery," in which the person with this ability can close his eyes and yet retain visually the entire page.

Another factor which may affect learning or reading comprehension is the ESP or extrasensory perception phenomenon. While ESP research is not accepted by all behavioral sciences, it is slowly growing in acceptance as a research variable. If, for example, it does exist in certain students, these students could be facilitated in learning to read, if other students were also reading the same passage at the same time, even though the other students were reading it silently.

No one doubts that there are solid biological factors affecting learning and comprehension. In most cases it would be difficult to teach a two-year-old or a ninety-two-year-old to learn to read. Determination of the ideal starting age is still a highly controversial

matter, but most western nations seem to have settled on an age somewhere between five and eight. Poor health can affect learning as well as fatigue. There is a distinct sex difference in learning to read; girls are superior to boys. Finally, there are a number of other physiological differences, such as body chemistry, alterations of which can facilitate or impede learning or comprehension. Some common examples of changes in body chemistry would be endocrine dysfunctions or the use of drugs.

The study of human personality is itself worthy of many books. Much work has been done in this field. Two widely known tests listing personality characteristics are Murray's Thematic Apperception Test and the Minnesota Multiphasic Inventory (MMPI). Other ways of classifying personality, or aspects of a personality, are the introversion-extroversion extreme, the various needs classification, and achievement motive, among others. Some of the work on personality has been done from the standpoint of the healthy personality, but much more of it has attempted to understand and cure the abnormal or mentally unhealthy personality.

Mental health, of course, can have an overriding influence on learning or reading and, as a factor in a classification cannot be ignored.

P. <u>Environmental Influence and Previous Learning</u>

1. Social class

2. Knowledge
   a. Basic skills (particularly language and writing)
   b. Subject matter

3. Childhood
   a. Rearing practices
   b. Home influence

4. Emotional learning
   a. Pleasant
   b. Unpleasant associations

If we don't know anything about 100 children except that they come from lower-class homes, and we have another group of children that we know nothing about except that they come from upper-class homes, we can immediately predict that there will be much greater reading achievement in the children from the upper-class homes. There are many reasons for this, but research has shown that the children from the upper-class homes learn easily, have fewer failures, and read more. Part of this has to do with such factors as the education of their parents, the sets of values of their parents and friends, and the types of occupations the children are expected to enter. Hence,

social class is a variable in learning to read, or in the amount of reading done.

The student's previous learning also affects his reading comprehension and future learning. Whether or not he is accomplished in the basic skills of writing and spelling, or whether or not he knows about a tractor, a switchblade, a bank, an iguana -- all make a difference in his reading comprehension and learning ability.

Many psychologists believe that childhood rearing practices have definite influences on the school behavior of children. Whether or not the child has received adequate amounts of his mother's attention may affect his reading. Whether the child is punished with a razor strap or verbal chastisement for bad behavior can affect his school performance, Likewise, a child picks up many pleasant and unpleasant associations at home and learns to love, fear, or dislike reading.

Q. <u>Measurement of Reading Ability</u>

1. When measured
   a. During learning
   b. Immediate post test
   c. Delayed post test

2. What measured
   a. Rote memory for facts
   b. Generalization of concepts
   c. Transfer of performance

3. How measured
   a. Recall (unaided memory, ex essay test)
   b. Recognition (memory with stimulus support, ex multiple choice test)
   c. Relearning (savings score)
   d. Performance test
   e. Cloze test
   f. Speed
   g. Attitude scale or inventory

4. Type of scoring
   a. Number right
   b. Number wrong
   c. Rights minus wrongs
   d. Probability of responding correctly
   e. Subjective rating
   f. Derived indicators (acquisition curves, retention curves)

5. Reading subskills
   a. Phonics
   b. Context clues
   c. Word analysis (roots, etc.)

6. Related Reading Skills
    a. Reference skills
    b. Reading poetry
    c. Detecting propaganda

This review of ways of measuring reading ability is intended to give some suggestions for the measurement of reading skill and comprehension. "How well does a student read?" is not a simple question. Nearly every factor listed in this section bears on the answer, and most of the categories in the total classification have direct implications.

R. Training Efficiency

1. Cost of materials
    a. Initial investment
    b. Long-term investment

2. Training time required

3. Quality of students required
    a. Aptitude level
    b. Prior experience

4. Quality of instructor required (cost)
    a. None required
    b. Formal qualifications (e.g., degrees)
    c. Other qualifications (e.g., personality)

5. Logistics
    a. Space requirement for training
    b. Space requirements of material
    c. Maintenance required for material
    d. Re-usability

6. Percentage of students reaching criterion

7. Amount of learning
    a. In comparison to other methods
    b. In comparison to objectives

8. Acceptance of training method
    a. By students
    b. By instructors
    c. By administration and others
    d. By parents

This category is really intended more for the administrator than for the teacher or student, although it can affect them all.

The task analysis concept frequently comes from military or industrial training situations, and the ultimate factor that the administrator searches for is efficiency. Cost is an ever-present factor and must be taken into account in all educational situations. Even though one particular system may be twice as good as another, if it costs 200 times as much as the other system, it probably will not be used. If the cost is the same and yet the program takes four times the amount of train ing time, it also probably will not be used. Likewise, if the situation works only on very high-IQ children, or if the system works but there is a fairly high percentage of failures, one must expect that the system will be readily discarded. Finally, if the training method is rejected by parents or teachers, or children, or administrators, it will undoubtedly be discarded. Hence teachers as well as administrators must take these training efficiency factors into consideration before and during the teaching of reading.

CONCLUSION

This classification, while far from complete, is intended to give an overview of the complexity of the reading act, both from the standpoint of teaching reading and from the standpoint of the learner, and the many factors which affect them. It is hoped that this classification may stimulate an interest in research into the problem, and facilitate understanding of research already done. It is also hoped that teachers may be helped to gain insight into some of the factors involved in the use of various teaching methods and materials.